

Static Frequency Converter System Installed and Tested



Static Frequency Converter.

A new Static Frequency Converter (SFC) system has been installed and tested at the NASA Glenn Research Center's Central Air Equipment Building to provide consistent, reduced motor start times and improved reliability for the building's 14 large exhausters and compressors. The operational start times have been consistent around 2 min, 20 s per machine. This is at least a 3-min improvement (per machine) over the old variable-frequency motor generator sets. The SFC was designed and built by Asea Brown Boveri (ABB) and installed by Encompass Design Group (EDG) as part of a Construction of Facilities project managed by Glenn (Robert Scheidegger, project manager). The authors designed the Central Process Distributed Control Systems interface and control between the programmable logic controller, solid-state exciter, and switchgear, which was constructed by Gilcrest Electric.

The new SFC is rated at 6500 kW and consists of a 12-pulse load-commutated rectifier, a direct-current (dc) link reactor, and a load-commutated inverter. The load-commutated rectifier converts the 60-cycle input voltage and current to a dc voltage and current. The dc reactor smoothes the rectified dc current and limits the fault current capability of the SFC. The load-commutated inverter then changes the dc voltage and current into an alternating current (ac) and voltage at a frequency between 2 and 60 Hz, depending on the requested speed setpoint given to the drive by the Central Process Distributed Control Systems. In addition, the SFC attempts to accelerate the motor at a constant torque level

by maintaining a constant volts-per-hertz ratio. It accomplishes this by controlling the excitation current of the synchronous motor being started.

The start sequence begins with the SFC commanding the motor exciter to output a field current pulse. This allows the SFC to determine if the rotor is stationary prior to the start and to determine the rotor position. The SFC provides pulsating power to the motor stator winding until the rotor reaches a speed of 2 Hz. Then, it switches to the load-commutative mode. After this, the SFC accelerates the motor to a speed of 59 Hz in a constant-torque mode and activates the synchronizer that will transfer the motor to the utility when the voltage, frequency, and phase angle are matched to the utility bus.

The new SFC requires only cooling fans and has no moving parts, which can require large amounts of preventative maintenance to be reliable. All 14 machines can be started in about 35 min in contrast to the approximately 1 hr, 10 min needed with variable-frequency motor generator sets. A second SFC is being installed that will allow all 14 machines to be started reliably in 15 min.

Find out more about Glenn's Research Testing Division

<http://www.grc.nasa.gov/WWW/RTD/>.

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